

WSDOT FOP for AASHTO TP 61¹

Determining the Percentage of Fracture in Coarse Aggregate

1. SCOPE

- 1.1. This test method covers the determination of the percentage, by mass, of a coarse aggregate sample that consists of fractured particles meeting specified requirements.
- 1.2. This standard may involve hazardous materials, operations, and equipment. This standard does not purport to address all of the safety problems associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.
- 1.3. The text of the standard reference notes provide explanatory material. These notes (excluding those in tables and figures) shall not be considered as requirements of the standard.

Method 1 will be used by WSDOT for determining the fracture of aggregate as required by the Standard Specifications.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards:*

- M 92, Wire-Cloth Sieves for Testing Purposes
- M 231, Weighing Devices Used in the Testing of Materials
- T 2, Sampling of Aggregates
- T 11, Materials Finer Than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
- T 27, Sieve Analysis of Fine and Coarse Aggregates
- T 248, Reducing Samples of Aggregate to Testing Size
- T 255, Total Evaporable Moisture Content of Aggregate by Drying

3. SUMMARY OF TEST METHOD

- 3.1. A sample of aggregate is separated using the designated size of screen conforming to the specification controlling the determination of coarse and fine aggregate. The coarse aggregate particles are visually evaluated to determine their conformance to the defined fracture. The percentage of conforming particles, by mass, is determined for comparison to standard specifications.

4. APPARATUS

- 4.1. *Balance* — shall have sufficient capacity, be readable to 0.1 percent of the sample mass, or better, and conform to the requirements of M 231 for general-purpose balance required for the principle sample mass being tested.
- 4.2. *Sieves*—Meeting the requirements of M 92.
- 4.3. *Splitter*—Meeting the requirements of T 248.

¹ This FOP is based on AASHTO TP 61-02 and has been modified per WSDOT standards. To view the redline modifications, contact WSDOT Quality Systems Manager at (360) 709-5412.

5. TERMINOLOGY

- 5.1. *fractured face*—an angular, rough, or broken surface of an aggregate particle created by crushing, or by other means. A face is considered a “fractured face” whenever one-half or more of the projected area, when viewed normal to that face, is fractured with sharp and well-defined edges: this excludes small nicks.
- 5.2. *fractured particle*—a particle of aggregate having at least the minimum number of fractured faces specified.

6. SAMPLING

Sample the aggregate in accordance with FOP for AASHTO T 2 and reduce the sample in accordance with FOP for AASHTO T 248, to the sample sizes shown in Table 1 of FOP for AASHTO T 27/11.

7. SAMPLE PREPARATION

- 7.1. Where the specifications list only a total fracture percentage, the sample shall be prepared in accordance with Method 1.

7.2. Method 1—Combined Fracture Determination

- 7.2.1. Dry the sample sufficiently to obtain a clean separation of fine and coarse material in the sieving operation. Sieve the sample in accordance with FOP for AASHTO T 27/11 over the No. 4 (4.75-mm) sieve.

Note 1: Where necessary, wash the sample over the sieve or sieves designated for the determination of fractured particles to remove any remaining fine material, and dry to a constant mass in accordance with FOP for AASHTO T 255.

- 7.2.2. Reduce the sample using a splitter in accordance with FOP for AASHTO T 248 to the appropriate size for test.

Nominal Maximum Particle Size	Minimum Sample Mass Retained No. 4 (4.75-mm) Sieve
1½ in (37.5 mm)	6 lb (2500 g)
1 in (25 mm)	3.5 lb (1500 g)
¾ in (19.0 mm)	2.5 lb (1000 g)
⅝ in. (16.0 mm)	2.0 lb (800 g)
½ in (12.5 mm)	1.5 lb (700 g)
⅜ in (9.5 mm)	0.9 lb (400 g)
No. 4 (4.75 mm)	0.4 lb (200 g)
<p>* For aggregate, the nominal maximum size, (NMS) is the largest standard sieve opening listed in the applicable specification, upon which any material is permitted to be retained. For concrete aggregate, NMS is the smallest standard sieve opening through which the entire amount of aggregate is permitted to pass.</p> <p>Note: For an aggregate specification having a generally unrestrictive gradation (i. e. wide range of permissible upper sizes), where the source consistently fully passes a screen substantially smaller than the maximum specified size, the nominal maximum size, for the purpose of defining sampling and test specimen size requirements may be adjusted to the screen, found by experience to retain no more than 5% of the materials.</p>	

Sample Size (Method 1, Combined Sieve Fracture)
Table 1

7.3 *Method 2*—Individual Sieve Fracture Determination WSDOT has deleted this section

8. PROCEDURE

8.1. Spread the sample on a clean flat surface large enough to permit careful inspection of each particle. To verify that a particle meets the fracture criteria, hold the aggregate particle so that the face is viewed directly. (See Section 5.1.)

8.2. To aid in making the fracture determination separate the sample into three categories: (1) fractured particles meeting the above criteria, (2) particles not meeting specification criteria, and (3) questionable or borderline particles.

8.3. Determine the mass of particles in the fractured category, the mass of questionable particles, and the mass of the unfractured particles.

9. CALCULATION

9.1. *Report the following information:*

9.1.1. Calculate the mass percentage of fracture faces to the nearest 1 percent as follows:

$$P = [(F + Q/2) / (F + Q + N)] \times 100$$

where:

P = percent of fracture,

F = mass of fractured particles,

Q = mass of questionable or borderline particles, and

N = mass of unfractured particles.

10. REPORT

Results shall be reported on standard forms approved for use by the agency. Report fracture to the nearest 1 percent.

Report the results using WSDOT Form 350-161 EF, 422-020X, or other report approved by the State Materials Engineer.

11. PRECISION AND BIAS

11.1. *Precision*—The research required to determine the precision of this standard has not been performed.

11.2. *Bias*—The research required to determine the bias of this standard has not been performed.

Performance Exam Checklist

Determining the Percentage of Fracture In Coarse Aggregate WSDOT FOP for AASHTO TP 61

Participant Name _____ Exam Date _____

Procedure Element	Yes	No
1. The tester has a copy of the current procedure on hand?	<input type="checkbox"/>	<input type="checkbox"/>
2. All equipment is functioning according to the test procedure, and if required, has the current calibration/verification tags present?	<input type="checkbox"/>	<input type="checkbox"/>
3. Sample reduced to correct size, if needed?	<input type="checkbox"/>	<input type="checkbox"/>
4. Sample dried and cooled, if necessary?	<input type="checkbox"/>	<input type="checkbox"/>
5. Sample properly sieved through specified sieve(s)?	<input type="checkbox"/>	<input type="checkbox"/>
6. Particles separated into fractured, unfractured, and questionable categories?	<input type="checkbox"/>	<input type="checkbox"/>
7. Dry mass of each category determined to nearest 0.1 g?	<input type="checkbox"/>	<input type="checkbox"/>
8. Calculation performed correctly?	<input type="checkbox"/>	<input type="checkbox"/>

First attempt: Pass ☐ Fail ☐

Second attempt: Pass ☐ Fail ☐

Signature of Examiner _____

Comments:

